

IN THE SPECIFICATION:

Please amend the paragraphs [0024] to [0107] of the published application as follows:

[0022] In order to accomplish the above-described object, the screw with stabilized strength ~~according to claim 1~~ of the present invention is characterized in that:

[0023] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0024] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves, and

[0025] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed in a substantially perpendicular attitude to a specified depth from the opening edge part, and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface.

[0026] The screw with stabilized strength ~~according to claim 2~~ of the present invention is characterized in that:

[0027] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0028] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves, and

[0029] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed so that the opening edge part sides of these wall surfaces expand in width at a specified angle and are substantially perpendicular to a specified depth,

and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface.

[0030] The screw with stabilized strength ~~according to claim 3~~ of the present invention is characterized in that in the above-described screw head in which a bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction is provided, the boundary portions formed between respective adjacent branching grooves are formed so that these boundary portions are adjacent via respective planar side wall surfaces that intersect at obtuse angles showing left-right symmetry with respect to the respective branching grooves in the central portion of the bit engaging groove.

[0031] The screw with stabilized strength ~~according to claim 4~~ of the present invention is characterized in that the above-described bit engaging groove is provided with respective step parts that are displaced at an inclination downward toward the central portion of the screw neck from the perpendicular lower edge portions of the respective outer circumferential end wall surfaces.

[0032] The screw with stabilized strength ~~according to claim 5~~ of the present invention is characterized in that the above-described bit engaging groove is formed with the intersecting central portion of the above-described respective step parts that are displaced with an inclination formed as a substantially circular conical bottom surface.

[0033] The screw with stabilized strength ~~according to claim 6~~ of the present invention is characterized in that the boundary portions that are formed between the respective adjacent branching grooves of the above-described bit engaging groove are formed so that these boundary portions are adjacent via bent side wall surfaces showing left-right symmetry with respect to the respective branching grooves in the central portion of the bit engaging groove.

[0034] The screw with stabilized strength ~~according to claim 7~~ of the present invention is characterized in that the boundary portions that are formed between the respective adjacent branching grooves of the above-described bit engaging groove are formed so that these boundary portions are adjacent via respective planar side wall surfaces that intersect at obtuse angles showing left-right symmetry with respect to the respective branching grooves in the central portion of the bit engaging groove.

[0035] The screw with stabilized strength ~~according to claim 8~~ of the present invention is characterized in that the above-described screw head in which a bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction is provided is constituted in a ~~[[pot]]~~pan-form or dish-form shape.

[0036] The screw with stabilized strength ~~according to claim 9~~ of the present invention is characterized in that:

[0037] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0038] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves,

[0039] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed in a substantially perpendicular attitude to a specified depth from the opening edge part, and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface, and

[0040] the surface of the screw head that forms the boundary portions which are between the respective adjacent branching grooves of the above-described bit engaging groove is formed as an inclined surface portion that is inclined gradually downward toward the central portion of the bit engaging groove.

[0041] The screw with stabilized strength ~~according to claim 10~~ of the present invention is characterized in that:

[0042] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0043] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width

dimension of the boundary portions which are between respective adjacent branching grooves,

[0044] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed so that the opening edge part sides of these wall surfaces expand in width at a specified angle and are substantially perpendicular to a specified depth, and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface, and

[0045] the surface of the screw head that forms the boundary portions which are between the respective adjacent branching grooves of the above-described bit engaging groove is formed as an inclined surface portion that is inclined gradually downward toward the central portion of the bit engaging groove.

[0046] The screw with stabilized strength ~~according to claim 11~~ of the present invention is characterized in that an inclined surface portion formed on the surface of the screw head that forms the boundary portions which are between the respective adjacent branching grooves of the above-described bit engaging groove is constructed so that this inclined surface portion is inclined at an angle of 20 degree to 50 degree toward the central portion of the bit engaging groove from the inner diameter sides of the respective outer circumferential end edge parts of the above-described bit engaging groove.

[0047] The combination of a screw with stabilized strength and a screwdriver bit ~~according to claim 12~~ is characterized in that in this combination:

[0048] the screw with stabilized strength is characterized in that:

[0049] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0050] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves, and

[0051] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed in a substantially perpendicular attitude to a specified depth from the opening edge part, and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface; and

[0052] the screwdriver bit is characterized in that it comprises a tip end blade part, vane parts, inclined parts, and protruding parts, wherein

[0053] the vane parts are respectively formed on the tip end blade part and have end edge parts that have a substantially right-angled shape to obtuse angular shape and engage with the respective branching grooves of the bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction in the head of the above-described screw with stabilized strength,

[0054] the inclined parts are respectively formed on the tip ends of the above-described respective vane parts and match the displaced portions of the above-described bit engaging groove, and

[0055] the protruding parts are formed to intersect and connect in a circular conical shape in the central axial part of the screwdriver bit.

[0056] The combination of a screw with stabilized strength and a screwdriver bit according to claim 13 is characterized in that in this combination:

[0057] the screw with stabilized strength is characterized in that:

[0058] bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0059] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves, and

[0060] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed so that the opening edge part sides of these wall surfaces expand in width at a specified angle and are substantially perpendicular to a specified depth,

and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface; and

[0061] the screwdriver bit is characterized in that it comprises a tip end blade part, vane parts, inclined parts, and protruding parts wherein:

[0062] the vane parts are respectively formed on the tip end blade part and have end edge parts that have a substantially right-angled shape to obtuse angular shape and engage with the respective branching grooves of the bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction in the head of the above-described screw with stabilized strength,

[0063] the inclined parts are respectively formed on the tip ends of the above-described respective vane parts and match the displaced portions of the above-described bit engaging groove, and

[0064] the protruding parts are formed to intersect and connect in a circular conical shape in the central axial part of the screwdriver bit.

[0065] The combination of a screw with stabilized strength and a screwdriver bit according to claim 14 is characterized in that in this combination:

[0066] the screw with stabilized strength is characterized in that:

[0067] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0068] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves,

[0069] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed in a substantially perpendicular attitude to a specified depth from the opening edge part, and are then displaced downward toward the central portion of the screw neck from the perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface, and

[0070] the surface of the screw head that forms the boundary portions which are between the respective adjacent branching grooves of the above-described bit engaging groove is formed as an inclined surface portion that is inclined gradually downward toward the central portion of the bit engaging groove; and

[0071] the screwdriver bit is characterized in that it comprises a tip end blade part, vane parts, inclined parts, and protruding parts wherein:

[0072] the vane parts are respectively formed on the tip end blade part and have end edge parts that have a substantially right-angled shape to obtuse angular shape and engage with the respective branching grooves of the bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction in the head of the above-described screw with stabilized strength,

[0073] the inclined parts that match the displaced portions of the above-described bit engaging groove are respectively formed on the tip ends of the above-described respective vane parts, and

[0074] the protruding parts are formed to intersect and connect in a circular conical shape in the central axial part of the screwdriver bit.

[0075] The combination of a screw with stabilized strength and a screwdriver bit according to claim 15 is characterized in that in this combination:

[0076] the screw with stabilized strength is characterized in that:

[0077] a bit engaging groove is formed in a Y shape divided into three substantially equal parts in the circumferential direction at a specified radial distance from the central portion of the screw head,

[0078] the groove widths of the respective branching grooves that extend in the radial direction from the central portion of the above-described bit engaging groove are formed so that these widths gradually expand, thus producing substantially equal intervals with the width dimension of the boundary portions which are between respective adjacent branching grooves,

[0079] the respective outer circumferential end wall surfaces of the above-described bit engaging groove are formed so that the opening edge part sides of these wall surfaces expand in width at a specified angle and are substantially perpendicular to a specified depth, and are then displaced downward toward the central portion of the screw neck from the

perpendicular lower edge portions, with the intersecting central portion being formed as a substantially circular conical bottom surface, and

[0080] the surface of the screw head that forms the boundary portions which are between the respective adjacent branching grooves of the above-described bit engaging groove is formed as an inclined surface portion that is inclined gradually downward toward the central portion of the bit engaging groove; and

[0081] the screwdriver bit is characterized in that it comprises a tip end blade part, vane parts, inclined parts, and protruding parts wherein:

[0082] the vane parts are respectively formed on the tip end blade part and have end edge parts that have a substantially right-angled shape to obtuse angular shape and engage with the respective branching grooves of the bit engaging groove formed in a Y shape divided into three substantially equal parts in the circumferential direction in the head of the above-described screw with stabilized strength,

[0083] the inclined parts that match the displaced portions of the above-described bit engaging groove are respectively formed on the tip ends of the above-described respective vane parts, and

[0084] the protruding parts are formed to intersect and connect in a circular conical shape in the central axial part of the screwdriver bit.

[0085] The combination of a screw with stabilized strength and a screwdriver bit according to claim 16 is characterized in that:

[0086] in the above-described screw with stabilized strength,

[0087] the bit engaging groove is provided with respective step parts that are displaced at an inclination downward toward the central portion of the screw neck from the perpendicular lower edge portions of the respective outer circumferential end wall surfaces, and

[0088] the intersecting center part of the above-described step parts that are displaced at an inclination is formed as a substantially circular conical bottom surface; and

[0089] in the above-described screwdriver bit,

[0090] step parts that match the step parts that are displaced at an inclination in the above-described bit engaging groove are formed on the tip ends of the above-described respective vane parts, and

[0091] the protruding parts are formed to intersect and connect in a circular conical shape in the central axial part of the screwdriver bit.

[0092] The combination of a screw with stabilized strength and a screwdriver bit according to claim 17 is characterized in that the above-described screwdriver bit is formed so that the vane widths of the respective vane parts extending in the radial direction from the central axial part of the tip end blade part gradually expand so as to constitute intervals that are substantially equal to the width dimension of the cut-in parts between the respective adjacent vane parts.

[0093] The header punch according to claim 18 of the present invention used for the manufacture of the above-described screw with stabilized strength is characterized in that:

[0094] protruding parts, which have perpendicular end wall parts used to form the respective outer circumferential end wall surfaces of the bit engaging groove formed in a Y shape divided into three equal parts in the circumferential direction in the screw head so that the wall surfaces are perpendicular to a specified depth, are respectively provided, and

[0095] a circular conical protruding part which is used to form the circular conical bottom surface of the bit engaging groove is disposed on the tip ends of the above-described protruding parts.

[0096] The header punch according to claim 19 of the present invention used for the manufacture of the above-described screw with stabilized strength is characterized in that:

[0097] protruding parts respectively have inclined end wall parts and perpendicular end wall parts that are provided for forming respective outer circumferential end wall surfaces of a bit engaging groove formed in a Y shape divided into three equal parts in a circumferential direction in a screw head, the inclined end wall parts being used to expand opening edge part sides in width at a specified angle, and the perpendicular end wall parts being used to form the wall surfaces so that the wall surfaces are perpendicular to a specified depth; and

[0098] a circular conical protruding part which is used to form the circular conical bottom surface of the bit engaging groove is disposed on the tip ends of the above-described protruding parts.

[0099] The header punch ~~according to claim 20~~ of the present invention used for the manufacture of the above-described screw with stabilized strength is characterized in that inclined protruding parts are provided which are used to form inclined surface portions that are inclined gradually downward toward the central portion of the bit engaging groove with respect to the boundary portions which are between the respective protruding parts that are adjacent in the circumferential direction of the base portions of the above-described protruding parts.

[0100] The header punch ~~according to claim 21~~ of the present invention used for the manufacture of the above-described screw with stabilized strength is characterized in that:

[0101] step parts, which are used to form the step parts of the bit engaging groove that are displaced at an inclination, are respectively provided on the tip ends of the above-described protruding parts, and

[0102] a circular conical protruding part, which is used to form the circular conical bottom part of the above-described bit engaging groove, is provided on the intersecting central portion of these step parts. (Effect of the Invention)

[0103] In the screw with stabilized strength ~~according to claims 1 through 8~~ of the present invention, as a result of the modification of the shape and structure of the bit engaging groove in a screw in which a Y-shaped bit engaging groove is formed in the screw head, the engagement operation with the corresponding screwdriver bit is easy, the occurrence of the phenomenon of "come-out" is prevented so that the working efficiency is high, and a uniform dispersion of torque transmission is realized so that this transmission is smooth and sufficient, thus stabilizing the screw in terms of strength as well.

[0104] In the screw with stabilized strength ~~according to claims 9 through 11~~ of the present invention, as a result of the shape and structure of the bit engaging groove, the strength of the header punch that is used to manufacture this screw is high, and as a result, the mass production of a screw of this type is made possible. Furthermore, since the engaging operation with the screwdriver bit is easy, application to recycled products and maintenance work is facilitated or made more efficient, so that the screw is usable advantageously as an all-purpose screw. In particular, in the screw with stabilized strength of the present invention, since inclined surface portions are formed in the boundary portions which are between the respective branching grooves of the bit engaging groove in the screw head, an appropriate

engaging operation of the tip end blade part of the screwdriver bit with respect to the bit engaging groove can be advantageously accomplished smoothly and quickly.

[0105] In the combination of a screw with stabilized strength and a screwdriver bit according to ~~claims 12, 13, 16 and 17~~ of the present invention, as a result of the shape and structure of the bit tip end being modified in accordance with the shape and structure of the bit engaging groove of the above-described screw with stabilized strength, a connection with the screw with stabilized strength is accomplished quickly and easily. Furthermore, the phenomenon of "come-out" during screw tightening work is securely prevented, and the working characteristics are improved. Moreover, other effects such as the stabilization of the strength of the bit tip end blade part so that a structure that is superior in terms of safety can be formed and the like are also obtained. More specifically, in the combination of a screw with stabilized strength and a screwdriver bit of the present invention, since the tip end blade part of the screwdriver bit is reinforced, damage and displacement of the tip end blade part during tightening of the screw is eliminated, so that problems such as various types of trouble with the screw, "come-out" and the like is completely prevented, and the combination is advantageously utilized as an all-purpose tightening fitting.

[0106] In the combination of a screw with stabilized strength and a screwdriver bit according to ~~claims 14, 15, 16 and 17~~ of the present invention, as a result of the shape and structure of the bit engaging groove, the structure of the tip end blade part of the corresponding screwdriver bit is reinforced. Consequently, damage and displacement (bending and the like) of the tip end blade part during screw tightening work is eliminated, so that problems such as various types of trouble with the screw, "come-out" and the like is completely prevented, and a screw that is superior in terms of wear resistance is obtained. Accordingly, the advantage of maintenance-free operation when the present invention is applied to automated machinery is obtained, and the combination is advantageously utilized as an all-purpose tightening fitting.

[0107] In the header punch according to ~~claims 18 through 21~~ of the present invention used for the manufacture of the screw with stabilized strength, as a result of the modification of the shape and structure adapted to form the bit engaging groove of the screw with stabilized strength, a screw with stabilized strength which is stabilized in terms of strength as described above is manufactured easily and at a low cost. More specifically, as a result of the

shape and structure of the punch being modified in accordance with the shape and structure of the bit engaging groove of the screw with stabilized strength, the strength of the punch is stabilized so that the durability is improved, which is extremely effective for the mass production of screws of this type.

Please amend paragraph [0112] of the published application as follows:

[0112] FIG. 5 is a top view of the head of a screw with stabilized strength in which the head is constructed as a ~~[[pot]]~~pan-shaped head as a second embodiment of the screw with stabilized strength according to the present invention.

Please amend paragraph [0116] of the published application as follows:

[0116] FIG. 9 is a top view of the head of a screw with stabilized strength in which the head is constructed as a ~~[[pot]]~~pan-shaped head as a third embodiment of the screw with stabilized strength according to the present invention.

Please amend paragraph [0120] of the published application as follows:

[0120] FIG. 13 is a top view of the head of a screw with stabilized strength in which the head is constructed as a ~~[[pot]]~~pan-shaped head as a fourth embodiment of the screw with stabilized strength according to the present invention.

Please amend paragraph [0124] of the published application as follows:

[0124] FIG. 17 is a top view of the head of a screw with stabilized strength in which the head is constructed as a ~~[[pot]]~~pan-shaped head as a fifth embodiment of the screw with stabilized strength according to the present invention.

Please amend paragraph [0187] of the published application as follows:

[0187] FIGS. 1 through 4 show a first embodiment of the screw with stabilized strength according to the present invention. More specifically, in FIGS. 1 through 4, the reference numeral 10A indicates the screw with stabilized strength according to the present invention. The head 10a of this screw 10A is formed in the shape of a ~~[[pot]]~~pan, and a bit engaging groove 12 is formed in the center of the top part of this head 10a.

Please amend paragraph [0192] of the published application as follows:

[0192] FIGS. 5 through 8 show another embodiment of the screw with stabilized strength according to the present invention. More specifically, in FIGS. 5 through 8, the reference numeral 10B indicates the screw with stabilized strength of this embodiment. The head 10a of this screw 10B is formed in the shape of a pan, and a bit engaging groove 12 is formed in the center of the top part of the head 10a.

Please amend paragraph [0197] of the published application as follows:

[0197] FIGS. 9 through 12 show a third embodiment of the screw with stabilized strength of the present invention. More specifically, in FIGS. 9 through 12, the reference numeral 10C indicates the screw with stabilized strength of the present embodiment; and the head 10a of this screw 10C is formed in the shape of a pan, and a bit engaging groove 12 is formed in the center of the top part of this head.

Please amend paragraph [0203] of the published application as follows:

[0203] FIGS. 13 through 16 show a fourth embodiment of the screw with stabilized strength according to the present invention. More specifically, in FIGS. 13 through 16, the reference numeral 10D indicates the screw with stabilized strength of the present embodiment. The head 10a of this screw 10D is formed in the shape of a pan, and a bit engaging groove 12 is formed in the center of the top part of this head 10a.

Please amend paragraph [0209] of the published application as follows:

[0209] FIGS. 17 through 20 show a fifth embodiment of the screw with stabilized strength according to the present invention. More specifically, in FIGS. 17 through 20, the reference numeral 10E indicates the screw with stabilized strength of the present embodiment; and the head 10a of this screw 10E is formed in the shape of a pan, and a bit engaging groove 12 is formed in the center of the top part of this head.

Please amend paragraph [0238] of the published application in two places as follows:

[0238] In the above description, combinations of screws with stabilized strength (applied to pan-shaped screws) and screwdriver bits, as well as header punches used to

manufacture the screws, are described as preferred embodiments of the present invention. However, the present invention is not limited to such ~~[[pot]]~~pan-shaped screws. For example, it goes without saying that the present invention is applicable to combinations of screws with stabilized strength, which are of the type of dish-shaped screws or screws of other types, and screwdriver bits, and further to header punches used to manufacture these screws. In addition, various design alterations are possible within ranges that involve no departure from the spirit of the present invention.